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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/772,664	02/05/2004	Yun Luo	TRW(TE)6895	5569

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TAROLLI, SUNDHEIM, COVELL & TUMMINO L.L.P.
1300 EAST NINTH STREET, SUITE 1700
CLEVEVLAND, OH 44114

EXAMINER	
FUJITA, KATRINA R	
ART UNIT	PAPER NUMBER
2609	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/09/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/772,664	LUO ET AL.	
	Examiner	Art Unit	
	Katrina Fujita	2609	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *02/05/2004, 09/05/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The abstract of the disclosure is objected to because it contains reference numerals from the drawings. Correction is required. See MPEP § 608.01(b).

2. The disclosure is objected to because of the following informalities:

On page 20, line 16, "classifier 614" should be --classifier 624--.

Appropriate correction is required.

Claim Objections

3. Claims 10 and 15 are objected to because of the following informalities:

In claim 10, line 3, "with the each classifier" should be –with ~~the~~ each classifier--.

In claim 15, line 2, "three-dimension image" should be --three-dimensional image--.

Appropriate correction is required.

4. The following is a quotation of 37 CFR 1.75(d)(1):

> The claim or claims must conform to the invention as set forth in the remainder of the specification and the terms and phrases used in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.

5. Claims 2 and 6 are objected to under 37 CFR 1.75(d)(1), as failing to conform to the invention as set forth in the remainder of the specification.

Claim 2 requires a feature vector to apply a classifier grid model to the input image. However, when the claim is read in light of the specification, "feature vector" should be "feature extractor", as it is stated that "A given feature extractor utilizes a classifier grid model" at page 20, line 18. Therefore, in line 1 of the claim, "given feature ~~vector~~ **extractor**" will be assumed for examination purposes.

Claim 6 requires an image source to include a stereo camera. A stereo camera is a camera that contains two lenses and sensors within a single structure, which is not supported by the disclosure. However, when the claim is read in light of the specification, "stereo camera" should be "stereo camera system", as it is stated that "the cameras 70, 72 are charge-coupled devices ("CCD") or complementary metal-oxide semiconductor ("CMOS") devices" at page 7, line 18. Therefore, in line 2 of the claim, "a stereo camera **system**" will be assumed for examination purposes.

6. The following is a quotation of 37 CFR 1.75(a):

> The specification must conclude with a claim particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention or discovery.

7. Claims 17 and 18 are objected to under 37 CFR 1.75(a), as failing to particularly point out and distinctly claim the subject matter which application regards as his invention or discovery.

Claim 17 lacks antecedent basis for "the classifier" at line 4. The following will be assumed for examination purposes: "the **pattern recognition** classifier".

Claim 18 lacks antecedent basis for "the classifier" at line 3. The following will be assumed for examination purposes: "the **pattern recognition** classifier".

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claim 1, 2, 4-7, 10-14, 16-22 and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Owechko et al. (US 6,801,662) and Smith et al. ("Quad-Tree Segmentation for Texture-Based Image Query", ACM article).

Regarding **claims 1, 2, 10, and 11**, Owechko discloses a system for object classification for use in a vehicle system ("systems and methods for detection and classification of objects for use in control of vehicle systems, such as air bag deployment systems" at col. 1, line 8) comprising

a vision system that images a vehicle interior to provide an input image ("system for detecting and tracking objects within a specified area that can be adapted for detecting and recognizing occupants within a vehicle" at col. 2, line 27; "vision-based system" at col. 2, line 39)

a plurality of pattern recognition classifiers (figure 1, numerals 135, 145, 155), each pattern recognition classifier operative to process feature data associated with the input image to determine an associated output class of the input image ("operate on the feature data to classify the occupant into one of a small number of classes" at col. 4, line 49); and

a plurality of feature extractors (figure 1, numerals 110, 120, 130, 140), each feature extractor extracting feature data from the input image for an associated one of the plurality of pattern recognition classifiers ("Feature extraction modules 110, 120, 130, and 140 receive and process frames from the stream of images 105 to provide feature data" at col. 4, line 46).

Owechko does not teach extracting feature data according to a classifier grid model representing the associated classifier wherein a given feature extractor applies the classifier grid model representing its associated classifier to the input image to produce a plurality of sub-images, the feature extractor extracting feature data relating to each of the plurality of sub-images and each grid model is derived from training images associated with the at least one associated output class.

Smith teaches a method of image segmentation to extract feature information based on a classifier grid model ("Using a quad-tree approach to image segmentation, feature sets are extracted from image blocks" at section 7, line 4) wherein the grid model is derived from training images ("training will construct discriminant functions general enough to discriminate between new and unknown textures" at section 4.1, line 9).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the feature extraction modules of Owechko using the quad-tree segmentation taught by Smith as described above, as an "efficient approach towards segmenting and representing textures...and provides a general framework by which other discriminating features can be used for image segmentation" (Smith at section 7, line 17).

Regarding **claim 4**, Owechko discloses a system wherein at least on of the plurality of pattern recognition classifiers includes an artificial neural network ("an NDA network is used to generate class confidences" at col. 10, line 57).

Regarding **claims 5 and 6**, Owechko discloses a system further comprising an image source that provides the input image wherein the image source includes a stereo camera system ("Means for capturing images of an area may comprise CMOS or CCD cameras" at col. 3, line 10; "stereo imaging system" at col. 7, line 58).

Regarding **claim 7**, Owechko discloses a system further comprising an arbitrator associated with the plurality of pattern recognition classifiers that evaluates a plurality of outputs associated with the classifiers and determines an associated output class for the input image from the plurality of classifier outputs ("predictions and confidences of the classifiers are then combined in a sensor fusion engine 170 which makes the final decision" at col. 4, line 56).

Regarding **claims 12 and 13**, Owechko discloses a system wherein at least one of the plurality of output classes represents a human adult seated within the vehicle and at least one of the plurality of output classes represents a rearward facing infant seat

positioned within the vehicle interior ("four classifications: adult in normal or twisted position, adult out-of-position (OOP), rear-facing infant seat (RFIS)" at col. 5, line 49).

Regarding **claim 14**, Owechko discloses a system wherein at least one of the plurality of output classes represents a human head ("when an occupant is out of position with a vision based algorithm capable of estimating the occupant position in real time and then tracking dynamically his head" at col. 7, line 34).

Regarding **claims 16-22, and 24-26**, Owechko discloses a method for classifying image data into one of a plurality of output classes comprising

imaging an unknown object to create an input image which includes imaging an occupant of a passenger seat within a vehicle;

extracting feature data from a plurality of images including extracting a set of at least one feature value from each image ("The $\sigma^{(d)}$'s are also stored in a vector" at col. 6, line 60; "The edge densities of each cell in the edge density map are stacked as features...provided by a feature vector" at col. 9, line 28; "motion density map cell form the feature vector" at col. 10, line 40) wherein the feature value includes a contrast measure ("The $\sigma^{(d)}$'s are also stored in a vector" at col. 6, line 60)

classifying the unknown object from the extracted feature data.

Owechko does not teach establishing a classifier grid model associated with a pattern recognition classifier, overlaying the classifier grid model over the input image to produce a plurality of sub-images such that each sub-image provides an equal number

of feature values to an associated feature vector wherein the feature values include a coarseness measure.

Smith teaches a method comprising

establishing a classifier grid model including

generating a representative image that represents at least one output class associated with the associated classifier ("An image database was generated by randomly compositing five cuts per image" at section 5.1, line 1) including

combining a plurality of training images associated with the classifier ("five cuts per image from 134 images consisting of 112 Brodatz texture images and 22 real world images" at section 5.1, line 2),

dividing the representative image according to an initial grid pattern to form a plurality of sub-images "'Queries-by-texture' were the performed on this composite image database" at section 5.1, line 12),

identifying at least one sub-image formed by said grid pattern having at least one attribute of interest (figure 2, "feature extraction"), and

modifying said grid pattern in response to the identified at least one sub-image having said at least one attribute of interest so as to form a modified pattern (figure 2, "feature extraction; figure 4a) including

modifying the grid pattern to divide the identified sub-images into respective pluralities of sub-images (figure 2, "feature extraction"; figure 4a)

wherein the identifying at least one sub-image and modifying the grid pattern in response to the identified sub-image are repeated iteratively until a termination event is recorded wherein the termination event comprises producing a modified grid that divides the class composite image into a threshold number of sub-images ("When no children are close, all children are kept as nodes, and quad-tree iteration continues on each child" at section 4.2.4, line 17)

overlaying the classifier grid model over the input image to produce a plurality of sub-images (figure 4a) such that each sub-image provides an equal number of feature values to an associated feature vector (figure 2, "feature extraction") wherein the feature values include a contrast measure ("texture segmentation by grouping spatial image blocks" at section 2.2, paragraph 2, line 1; "treat each block as a separate image of texture" at section 3.2, line 1).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the feature extraction modules of Owechko using the quad-tree segmentation taught by Smith as described above, as an "efficient approach towards segmenting and representing textures...and provides a general framework by which other discriminating features can be used for image segmentation" (Smith at section 7, line 17).

10. Claims 3 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Owechko and Smith as applied to claim 1 above, and further in view of Gokturk et al. (US 2004/0153229; hereinafter referred to as Gokturk '229, which incorporates teachings from Gokturk et al. (US 2003/0169906; hereinafter referred to as Gokturk '906)).

Regarding **claim 3**, the Owechko and Smith combination teach the elements of claim 1 as shown in the 103 rejection above.

The Owechko and Smith combination does not teach a system wherein at least one of the plurality of pattern recognition classifiers includes a support vector machine.

Gokturk '229 discloses a system in the same field of endeavor of vehicle safety ("relates to intelligent deployment and use of such airbags and safety restraints for vehicles" at paragraph 0002, line 3) wherein at least one of the plurality of pattern recognition classifiers includes a support vector machine ("images are next fed into a training algorithm such as nearest neighbor classification, support vector machines" in paragraph 0147, line 17).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the classifier modules of Owechko and Smith using the algorithm taught by Gokturk '229 as described above, to find "the best differentiating hypersurface...that optimally differentiates the data belonging to the particular class C_i, from the rest of the data belonging to any other" (Gokturk '906 at paragraph 0085, line 5).

Regarding **claim 8**, the Owechko and Smith combination teaches the elements of claim 1 as described in the 103 rejection above.

The Owechko and Smith combination does not teach an image preprocessor that removes background information and noise from the input image.

Gokturk '906, referenced by Gokturk '229, teaches an image preprocessor that removes background information ("subtracting the background image from the image" at paragraph 0068, line 3) and noise from the input image ("morphological opening operation may be executed to remove the noise" at paragraph 0068, line 13).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the pattern recognition classifier assembly of Owechko and Smith using the preprocessing taught by Gokturk '229 as described above, to eliminate "unwanted portions of the depth image (or alternatively the intensity image)" (Gokturk '906 at paragraph 0068, line 10).

11. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Owechko and Smith as applied to claims 1 and 11 above, and further in view of Krumm (US 5,983,147).

The Owechko and Smith combination teaches the elements of claim 11 as described in the 103 rejection above.

The Owechko and Smith combination does not teach producing three-dimension image data of the vehicle interior as a stereo disparity map.

Krumm teaches producing three-dimension image data of the vehicle interior as a stereo disparity map ("disparity image--one that gives disparity values at every point in the image" at col. 6, line 17).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the vision system of Owechko and Smith using the disparity map taught by Krumm as described above, to provide "an invariant image for classification" (Krumm at col. 6, line 14) that eliminates the need to "compute range values" (Krumm at col. 6, lines 11-14).

12. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Owechko, Smith and Gokturk '229 as applied to claim 8 above, and further in view of Ericksen et al. ("MAHEM: A Multiprocessor...", SPIE article).

The Owechko, Smith and Gokturk combination teach the elements of claim 8 above.

The Owechko, Smith and Gokturk combination does not teach applying a contrast limited adaptive histogram equalization that adjusts the image for lighting conditions.

Ericksen teaches a contrast limited adaptive histogram equalization that adjusts the image for lighting conditions ("Contrast Limited Adaptive Histogram Equalizaton (CLAHE)" in section I, line 3; "sensitivity to the intensity distribution is limited to visually relevant (nearby) intensities" in section III, paragraph 1, line 8).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the image preprocessor of Owechko, Smith and Gokturk using the histogram equalization taught by Ericksen as described above, to not "enhance noise in relatively constant-level areas of the image" (Ericksen at section III, paragraph 4, line 2).

13. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Owechko and Smith as applied to claim 22 above, and further in view of Kaplan et al. ("Texture Segmentation using Multiscale Hurst Features", IEEE Article).

The Owechko and Smith combination teaches the elements of claim 22 as described in the 103 rejection above.

The Owechko and Smith combination does not teach a feature value including an average grayscale value.

Kaplan teaches a feature value including an average grayscale value ("mean feature is computed as the average grayscale" at section 4.1, paragraph 3, line 1).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the feature extractors of Owechko and Smith using the mean feature taught by Kaplan as described above, to provide another measure for consideration that would improve classification accuracy.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 6,608,910, US 6,856,694 and US 6,507,779 are each pertinent as teaching vehicle safety systems.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katrina Fujita whose telephone number is (571) 270-1574. The examiner can normally be reached on M-Th 8-5:30pm, F 8-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian P. Werner can be reached on (571) 272-7401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KF

Katrina Fujita
Art Unit 2609

BRIAN WERNER
SUPERVISORY PATENT EXAMINER